

Acoustical Testing Laboratory Developed to Support the Low-Noise Design of Microgravity Space Flight Hardware

The NASA John H. Glenn Research Center at Lewis Field has designed and constructed an Acoustical Testing Laboratory to support the low-noise design of microgravity space flight hardware. This new laboratory will provide acoustic emissions testing and noise control services for a variety of customers, particularly for microgravity space flight hardware that must meet International Space Station limits on noise emissions. These limits have been imposed by the space station to support hearing conservation, speech communication, and safety goals as well as to prevent noise-induced vibrations that could impact microgravity research data.

The Acoustical Testing Laboratory consists of a 23 by 27 by 20 ft (height) convertible hemi/anechoic chamber and separate sound-attenuating test support enclosure. Absorptive 34-in. fiberglass wedges in the test chamber provide an anechoic environment down to 100 Hz. A spring-isolated floor system affords vibration isolation above 3 Hz. These criteria, along with very low design background levels, will enable the acquisition of accurate and repeatable acoustical measurements on test articles, up to a full space station rack in size, that produce very little noise. Removable floor wedges will allow the test chamber to operate in either a hemianechoic or anechoic configuration, depending on the size of the test article and the specific test being conducted. The test support enclosure functions as a control room during normal operations but, alternatively, may be used as a noise-control enclosure for test articles that require the operation of noise-generating test support equipment.



The Acoustical Testing Laboratory test chamber is a convertible hemi/anechoic facility with 34-in.-deep fiberglass wall and ceiling wedges. Removable floor wedge pallets incorporate a walking surface above the wedge tips.

The Acoustical Testing Laboratory will provide a comprehensive array of acoustical testing services, including sound power level testing per ANSI S12.34 and ANSI S12.35. A multichannel PC-based acoustical data acquisition system allows simultaneous acquisition and real-time analysis of signals to facilitate the identification of equipment noise sources and transmission paths. Acoustical Testing Laboratory will function as a design verification facility, producing data to document requirements compliance and, more importantly, as an in-house lab where noise-control design strategies can be actively pursued and integrated into the overall design of flight hardware early in the life of each project.

The Acoustical Testing Laboratory was designed and constructed to meet the requirements of the Fluids and Combustion Facility project and was funded by the Microgravity Sciences Division. Acoustical design requirements were provided by the Engineering Design and Analysis Division, with technical facilities-engineering support from the Facilities Test and Engineering Division (FTED).

Construction was managed by the FTED Construction Management Branch and implemented under Glenn Research Center's 8A construction program. The anechoic chamber and test-support enclosure were designed, fabricated, and installed by Eckel Industries of Cambridge, Massachusetts. The Acoustical Testing Laboratory will be operated by the Engineering Design and Analysis Division, joining their other vibroacoustic test services: the Structural Dynamics Laboratory and the Microgravity Emissions Laboratory.

Find out more about this research (<http://www.grc.nasa.gov/WWW/AcousticalTest/>)

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